SUMMARY TABLE 1. SAVINGS FROM ALTERNATIVES TO THE ADMINISTRATION'S STRATEGIC PROGRAM (By fiscal year, in billions of 1984 budget authority dollars)

	1984	1985	1986	1987	1988	Total 1984 to 1988	Total 1984 to 2000
Alternative I--Cancel MX a/							
Investment	4.6	5.0	3.6	2.8	1.8	17.9	18.4
Operating	--	--	--	--	--	--	--
Total	4.6	5.0	3.6	2.8	1.8	17.9	18.4
Alternative II--Substitute Sea-based Forces for Land-based Forces a/							
Investment	4.9	4.1	3.9	2.4	4.6	19.9	41.4
Operating	--	--	--	--	--	--	19.6
Total	4.9	4.1	3.9	2.4	4.6	19.9	61.0
Alternative III--Cancel B-1B Bomber							
Investment	3.9	7.0	4.3	-1.6	-2.0	11.7	10.8
Operating	--	b/	0.1	0.4	0.6	1.1	4.8
Total	3.9	7.0	4.4	-1.2	-1.3	12.8	15.5

SOURCE: Congressional Budget Office.

NOTES: Numbers may not add to totals because of rounding. Costs do not include those funded by the Department of Energy.

a/ Savings would be higher relative to the President's January 1983 Budget, which assumes an earlier, more expensive MX plan.

b/ Less than $100 million.

soon nor offer all of the qualitative benefits that might come from deploying the MX missile, such as a demonstration of steadfastness of purpose that would strengthen the hand of U.S. arms control negotiators.

Alternative 2: Substitute Missiles on Submarines for Land-Based Missiles

For more than a decade, the United States has sought a basing mode for a land-based missile that could guarantee survivability against a Soviet first strike and also respond to environmental and political concerns in this country. Cost considerations, plus continued difficulties in meeting the other concerns, might prompt the Congress to abandon the quest for a survivable land-based missile force in favor of increasing the capability of the submarine-based forces. The following discussion examines the consequences of terminating all efforts toward new land-based missiles--including the MX and the small ICBM--in favor of building more Trident submarines equipped with the new Trident II (D-5) missile.

Quantitative Contributions of Submarine-Based Missiles. Deploying additional submarines would roughly compensate for the loss of the land-based missiles. CBO estimates that five to nine additional Trident submarines, equipped with the new Trident II missile, would about equal the surviving capability of the 100 new MX missiles plus the 600 surviving warheads assumed to be contributed by the follow-on SICBM land-based missile planned for the 1990s. Five additional submarines would be needed to match the number of hard-target warheads, while nine additional submarines would be needed, given current operating procedures, to match the number of prompt, hard-target warheads.

Assuming production of Trident submarines was increased to three every two years starting in 1985, these added submarines could be produced with existing shipyard capability and would all enter the fleet around the turn of the century. This would be just a few years later than the full deployment of the follow-on SICBM land-based missile, to occur in the middle to late 1990s.

Savings from Submarines. Five additional Trident submarines and their missiles would cost about $12.8 billion to buy and $0.3 billion a year to operate, for 20-year costs of $18.8 billion. Nine additional submarines would cost roughly twice as much.

The cost of land-based missiles would be substantially more than even the nine additional Tridents. The cost for the Administration's current MX plan alone would be $18.4 billion in 1984 and beyond. Should a road-mobile, small ICBM eventually be deployed as part of the Administration's plan, its cost would be substantial. According to the Department of Defense,

fielding 1,000 such missiles would cost $46.2 billion to buy, plus about $3 billion in annual operating costs, for a 20-year life-cycle cost of $107 billion. Taken together, the life-cycle costs of the MX and small ICBM would exceed those of nine additional Tridents by a factor of more than three.

Aside from its potential long-term savings, this approach would clearly cut costs over the next five years. Despite the added costs of beginning even a nine-submarine addition, net savings would amount to a total of $19.9 billion in budget authority (see Summary Table 1). Most of the savings would come from terminating deployment of the MX missile.

Forgoing the Key Advantages of a Survivable Triad. Giving up attempts to develop a survivable, land-based missile would mean forgoing many of the important advantages of a triad of U.S. forces, each able to survive a Soviet first strike. A triad hedges against a loss of capability in any single element, and makes it more difficult for an opponent to develop a successful attack. Striving for survivability in each triad leg also minimizes the risk of a future Soviet technological breakthrough. Moreover, land-based missiles have an advantage over the other legs of the triad in greater responsiveness and more assured command and control.

Under this alternative, the United States would be concentrating more of its strategic deterrent in the submarine force. Even though submarine-based missiles are thought by many to be invulnerable through the 1990s, there can be no absolute certainty of it. Again, some maintain that failure to deploy a new land-based missile would show a lack of resolve on the part of the United States.

This alternative would not, however, mean forgoing all of the advantages of land-based missiles. The United States would still have 1,000 Minuteman missiles, with their 2,100 warheads, at least through the end of this century.

Alternative 3: Cancel B-1B and Upgrade Existing Bomber Force

The Administration proposes to buy and deploy 100 B-1B bombers by 1988, to be followed in the early 1990s by deployment of 132 Advanced Technology--or "stealth"--bombers (ATBs). Given the promise of a capable ATB and the ability to upgrade the B-52 and air-launched cruise missile (ALCM) forces to provide some of the near-term capabilities of the B-1B, the Congress might elect to cancel the B-1B program.

Upgrading the B-52 and ALCM Forces. The United States could upgrade its existing bomber force by further improvements to B-52s so that

more could be retained through the 1990s, and by converting them to carry more air-launched cruise missiles. In addition, the total number of cruise missiles could be expanded and the rate of buy maintained at current levels in the near term.

These actions, along with termination of the B-1B, would leave U.S. forces with about the same number of weapons before a Soviet first strike. After a Soviet attack without warning, this alternative would contribute 4 percent fewer warheads to U.S. retaliatory capability than the Administration's program in 1990, and 3 percent fewer in 1996. These differences would be smaller if the attack came after some warning. The difference occurs primarily because the B-1B would be better able to escape a Soviet attack on its bases than would the B-52, and because the newer force would presumably be able to sustain a somewhat higher peacetime alert rate.

Savings from Terminating B-1B. Stopping further production of the B-1B would cut costs. Even when offset by the added costs of improving the B-52 force and buying more cruise missiles, this alternative would save a total of about $12.8 billion in budget authority in 1984-1988 and $15.5 billion through the end of the century (see Summary Table 1). Critics of the B-1B argue that these savings may be needed, in a period of constrained defense budgets, to ensure that sufficient funds are available to develop and deploy the ATB, which they see as offering the greatest long-run promise.

Key Advantages of the B-1B. These cost and effectiveness differences do not necessarily capture the whole issue. For example, if the B-1B were canceled in favor of upgrading the current force of B-52 bombers and ALCMs, there would be only a modest reduction in warheads able to survive a Soviet first strike and retaliate. But this does not take into account the B-1B's greater ability to penetrate Soviet air defenses and deliver its warheads. Unclassified estimates of the B-1B's greater potential are not available, but it may be substantial.

The B-1B would also, as a new bomber, offer a hedge against the risk that the technically sophisticated ATB might not be developed on time or at a reasonable cost. Moreover, the B-1B would hold down the average age of the U.S. bomber fleet, leading to improved reliability and maintainability. By 1996, even with the ATB, the fleet would average 23 years without the B-1B, but only 14 years with it.

Finally, the B-1B could make a substantial contribution to U.S. nonnuclear forces. It would, for example, provide a highly capable aircraft for the long-range missions envisioned in support of the Rapid Deployment Forces.

CHAPTER I. U.S. PLANS FOR STRATEGIC FORCE MODERNIZATION

On October 2, 1981, President Reagan announced the most comprehensive and expensive plan for upgrading and expanding U.S. nuclear offensive and defensive forces since the strategic buildup that occurred in the late 1950s and early 1960s. This new modernization effort, requiring an estimated $250 billion during 1984-1988, would expand and modernize each of the three legs of the triad of strategic offensive forces: land-based missiles, submarine-based missiles, and bombers.

U.S. strategic forces are primarily intended to deter the Soviets from initiating a nuclear war. They are designed to survive a Soviet nuclear strike in numbers sufficient to retaliate in a manner deemed appropriate by the national command authority. In recent years, the Soviets have increased the numbers of their nuclear weapons and their capability to destroy some U.S. weapons in a first strike. The Administration feels that the United States must now expand and improve its forces and increase their capability of surviving a first strike. This means finding a way to deploy land-based missiles that would allow them to survive against more accurate Soviet land-based missiles, improving the abilities of U.S. bomber forces to evade increasingly sophisticated Soviet air defenses, and deploying more capable sea-based weapons.

The modernization plan has five elements: three deal with the land, air, and sea components of the strategic triad, and the other two with U.S. air defenses and strategic command and control. Because of their cost and importance, this study focuses on the first three components--the upgrading of the so-called strategic offensive forces.

The 98th Congress will face several fundamental decisions regarding strategic force modernization. These decisions will affect the composition and scope of the U.S. nuclear arsenal through the end of this century. This study begins by reviewing the Administration's proposals for modernization and the criteria for judging them (Chapter I). It then evaluates the strategic force buildup and the contribution of each of the components (Chapter II). The paper also analyzes the likely effects of arms-control agreements on overall force levels (Chapter III). Finally, it discusses three ways in which the Administation's program could be modified to reduce costs: by terminating the MX missile, by focusing on submarine-based missiles and forgoing modernization of the land-based leg of the triad, or by

terminating the B-1 bomber program (Chapter IV). The study assesses the three alternatives in terms of their impact on force effectiveness, their costs, and their compatibility with arms-control agreements.

ADMINISTRATION PLANS FOR STRATEGIC OFFENSIVE FORCES

For more than two decades, U.S. nuclear offensive forces have consisted of the triad of land-based intercontinental ballistic missiles (ICBMs), long-range bomber and tanker aircraft, and submarine-launched ballistic missiles (SLBMs). All of these have been modified over the years for strategic and technological reasons. Even with continuous upgrading, however, the inventory is becoming old--based on outdated technology and limited in the extent to which it can incorporate further modifications.

Although replacement systems in all three areas have been suggested and developed during the last decade, major replacements have been undertaken only in the submarine fleet, where Polaris submarines are being retired as the new Tridents are introduced. The Administration's modernization plans call for a number of important changes in each of the three "legs" or parts of the triad. Table 1 shows the fielding dates of the current and projected inventory of nuclear weapons systems under the Administration plan.

The Intercontinental Ballistic Missile (ICBM) Force

U.S. land-based intercontinental ballistic missiles today include 1,000 Minuteman missiles and 47 Titan missiles. These are based in underground silos, mostly located in the midwestern United States. In recent years there has been rising concern that the Soviet Union, with its large and accurate ICBM warheads, could destroy most U. S. ICBMs during a nuclear first strike.

No part of the Administration's program has received more attention than its proposal to modernize the ICBM force by deploying the MX missile, possibly followed by deployment of a new, small ICBM. Considerable controversy has arisen over an appropriate basing system for ICBMs to ensure that a sufficient number of missiles could survive a Soviet first strike.

The problem of ensuring the survivability of U.S. land-based missiles began to arise as early as the mid-1960s, when Soviet deployment of the SS-9 ICBM pointed toward the day when--at least in theory--combinations

TABLE 1. STRATEGIC FORCES INVENTORIES FOR FISCAL YEARS 1983, 1990, AND 1996 (In the absence of nuclear arms-control limits) a/

Inventory	First Deployment	End of Fiscal Year 1983	1990	1996
Land-Based Missile Force				
Titan	1962	43	0	0
Minuteman II	1965	450	450	450
Minuteman III	1970	550	450	450
MX	1986	0	100	100
SICBM	1993	0	0	1,000
Bomber Force				
FB-111	1969	56	56	0
B-52 G	1959	170	105	0
B-52 H	1961	96	96	96
B-1B	1986	0	100	100
ATB	1991	0	0	132
Submarine Force b/				
Poseidon (C-3)	1971	19/304	19/304	8/128
Poseidon (C-4)	1979	12/192	12/192	5/80
Trident (C-4)	1982	3/72	8/192	3/72
Trident (D-5)	1990	0/0	4/96	16/384

a/ A detailed description of force structure evolution is contained in Appendix B.

b/ Values show numbers of submarines/launchers, and dates indicate missile deployment dates.

THE ICBM FORCE

Titan II. Introduced in 1962, the 47 operational Titan IIs are the oldest ICBMs in the U.S. inventory, and the only liquid-fueled ones. Each carries a single, large-yield, relatively inaccurate warhead. These are to be retired by the end of fiscal year 1987. According to present plans, their silos will be maintained in a caretaker status.

Minuteman II. The 450 single-warhead Minuteman IIs were deployed starting in 1965. Their warheads are relatively large but inaccurate.

Minuteman III. At present, the only operational U.S. ICBMs equipped with multiple independently targetable reentry vehicles (MIRVs) are the 550 triple-warhead Minuteman IIIs, of which 250 carry the Mk 12 warhead and 300 the higher-yield and more accurate Mk12A.

The MX. The MX missile is considerably larger than Minuteman, more than tripling the throwweight and doubling the accuracy of its predecessor. One MX can deliver up to ten Mk 21 warheads. Initially the Administration plans to field 100 MX in existing Minuteman silos starting in 1986. Additional MX missiles could be deployed at a later date.

The SICBM. Administration plans call for engineering development on a new, small ICBM (SICBM). It would probably be about half the length of the MX missile and weigh only 15 percent as much. It would carry a single warhead, probably have the accuracy needed to destroy hardened targets, and--by virtue of its small size--be deployable in a variety of fixed and mobile modes. Initial operational capability could come in the early 1990s.

of larger warhead yields and improved ballistic guidance systems would place all but the hardest of fixed installations at risk. 1/ In 1972 the Air Force developed a requirement for a new ICBM--known as the MX--that not only would be capable of destroying targets hardened against nuclear blasts but would itself be able to survive a similar attack. The linkage between the MX missile and its basing was forged at the outset. 2/

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1. See Office of Deputy Undersecretary of Defense for Research and Engineering (Strategic and Space Systems), ICBM Basing Options, December, 1980, p. i. The "hardness" of an installation refers to its ability to withstand nuclear effects, primarily blast and overpressure.

2. See House Appropriations Committee, DoD Appropriations for FY 1983, 97:2, Part 4, February 25, 1982, p. 611.

Each Administration since the mid-1970s has wrestled with the problem. Over 30 possible deployment plans have been examined; each has been rejected, either because it was not cost-effective, was not politically feasible, or would alter the unique contribution of land-based missiles to the triad. In 1979 the Carter Administration, believing it had a workable plan, proposed deployment of 200 MX in the multiple protective structures (MPS) mode. This proved controversial because it would have required a vast land area and prevented access to natural resources where it was located. It also suffered from its association with the SALT II agreement. The Reagan Administration cancelled MPS in 1981, citing these factors plus its belief that MPS would not be survivable. Instead it called for examination of a number of basing proposals and a choice of one by 1984, while in the interim deploying 40 MX missiles in Minuteman silos. In the fall of 1982, the Administration--directed by the Congress to find a survivable basing mode for the MX--announced its decision to deploy 100 MX in the closely spaced basing (CSB)--or "Dense Pack"--mode. CSB also became highly controversial, again because of the survivability issue.

The long-standing problem of finding an acceptable ICBM basing mode led the Congress, in the 1983 Defense Appropriations Act, to require that the Administration reexamine virtually the entire concept of land-based missiles and specifically revisit the MX basing decision. In response, the Administration convened the President's Commission on Strategic Forces to provide recommendations on a long-term course of action.

Based primarily on the Commission's recommendations, the Administration has proposed a multi-faceted approach to modernizing the land-based missile force. 3/ Initially 100 MX missiles would be deployed in existing Minuteman ICBM silos, starting in 1986. Engineering design on a new, small ICBM (SICBM) would begin almost immediately, leading to full-scale development in 1987. Additional research would be done on basing alternatives for the SICBM and on the superhardening of missile silos. Depending on the results of these research efforts, as well as on the status of the arms control process and the Soviet missile threat, a decision would be made later either to proceed with the deployment of additional MX missiles in superhardened silos (possibly in a CSB-like system) or to move ahead with the SICBM. Should the latter course be chosen, a decision would then be made on whether to base the new missile in superhardened silos (perhaps with additional silos for deception), in a mobile mode, or in a combination of fixed and mobile basing. Once again, the decision would hinge on the results of research and development and on the status of the

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3. For details see the Report of the President's Commission on Strategic Forces (April 1983).

strategic balance at the time. Ballistic missile defense might also be incorporated, if one of the non-mobile basing modes was chosen. Deployment of the new ICBM could begin in the early 1990s.

Because of the uncertainty surrounding the ultimate size and shape of the future ICBM force, it is difficult at this time to characterize the outcome of the Administration program. In order to illustrate its potential effects, this study assumes that a new, small ICBM will be chosen for development, and that 1,000 of these SICBMs will be ultimately deployed in a land-mobile mode. 4/ The study assumes that the total system would provide approximately 600 surviving warheads after a Soviet first strike. 5/ This is also similar to estimates attributed to the Air Force for MX in CSB. Appendix A discusses the parameters that are important in designing such a system and their relation to the system's size, cost, and political feasibility. Further details are included in the discussion of alternatives to the Administration's approach in Chapter IV.

The Administration's plan would continue to maintain the remaining force of 900 Minuteman missiles. It would also continue retiring the 47 older, single-warhead Titan missiles during the early and mid-1980s.

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4. This assumption is based on the force size used in the DoD Strategic Forces Technical Assessment Review of March 31, 1983.

5. General Brent Scowcroft, Chairman of the President's Commission on Strategic Forces, and Dr. Harold Brown, former Secretary of Defense and a consultant to the commission, testified before the Senate Armed Services Committee on April 18, 1983, that it would not be feasible to deploy the SICBM in the present arms-control environment because of the staggering costs of the number of missiles required and the extensive use of non-military land in peacetime. CBO has estimated that, given an illustrative arms-control-constrained threat of 2,000 half-megaton weapons, a system of 1,000 mobile launchers hardened to approximately 30 psi (as indicated in the DoD Strategic Forces Technical Assessment Review of March 31, 1983), and deployed on approximately 17,000 square nautical miles of available military land in the west would provide about 600 surviving warheads. (See Appendix A for details.) CBO has assumed that if a decision was made to deploy the SICBM in the early 1990s, even in the absence of an arms-control agreement that would limit the threat, the decision would be made to incur the financial or environmental costs necessary to provide about this level of survivability. For example, doubling the size of the threat would require roughly twice as much land area, meaning the addition of non-military property.

The long-run costs of the ICBM modernization program are difficult to assess because the nature of the follow-on missile has yet to be determined. Deployment of 100 MX in existing silos would, however, cost $18.4 billion.

The Strategic Bomber Force

At the end of 1983, U.S. bomber forces will consist of about 266 B-52s, 56 smaller FB-111s, and about 500 air-launched cruise missiles. The bombers were designed to penetrate Soviet air defenses and deliver bombs or short-range attack missiles. With their improving air defenses, however, the Soviets may have become capable of destroying many of these aircraft before they reach their targets.

In response, some B-52s are being refitted to carry air-launched cruise missiles that can be delivered at long distances from the target, thereby avoiding most of the air defenses. Cruise missiles would complicate Soviet air defense problems by presenting large numbers of small targets. The Administration believes however, that it is necessary to maintain an ability to penetrate Soviet air defenses with a manned bomber as well. Such a capability would be useful in attacking mobile targets and in other missions where a manned system is preferable. Accordingly, it proposes to deploy two new bombers. 6/

Indeed, this is the most expensive set of proposals in the Administration plan. The Department of Defense estimates the investment and operating costs over the six-year period 1982-1987 at $63 billion in 1982 dollars. 7/ One hundred new B-1B bombers would be fielded in the mid-1980s, followed by 132 Advanced Technology Bombers (ATB)--also known as "stealth" bombers--starting in the early 1990s. 8/ Additionally, the Administration would deploy 3,200 air-launched cruise missiles (ALCMs), carried initially on B-52 bombers refitted for this mission, and eventually on the B-1B. The Administration further proposes to develop and deploy a longer-range advanced cruise missile, also having stealth characteristics, which would

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6. The Congress, in the DoD Appropriations Act for Fiscal Year 1981, directed the DoD to field a new manned bomber by 1987.

7. CBO estimates of the costs of selected parts of the Administration's plan are presented in Chapter IV.

8. See remarks of Senator Carl Levin, Congressional Record, December 3, 1981, p. S14378.

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THE BOMBER FORCE

FB-111A. A medium bomber first introduced in 1969, the FB-111A is expected to remain on duty as a strategic asset through the 1980s, and to phase into a tactical role in the early 1990s.

B-52G. Delivered between 1959 and 1961, the B-52Gs have received extensive structural and avionics modifications over the years. Equipping of 105 B-52Gs to carry 12 cruise missiles (ALCMs) on external wing pylons will be completed by the end of 1984. The remaining B-52Gs will probably retain their nuclear roles until the late 1980s, and will also become the primary conventional/maritime support force. The ALCM-equipped B-52Gs will probably also carry nuclear bombs and short-range attack missiles until the B-1B becomes available to take over part of the penetrator role. Used thereafter as standoff ALCM carriers, these B-52Gs would probably be retired in the 1990s.

All B-52s will receive hardening against electromagnetic pulse (EMP), avionics upgrades like the Offensive Avionics System (OAS), new radio receivers, and updated electronic countermeasures equipment.

B-52H. These were delivered between 1961 and 1962. Beginning in 1985, all 96 B-52Hs are slated for modification to carry ALCMs externally--like the B-52Gs--as well as eight missiles internally. While continuing their role as penetrating bombers into the late 1980s, these aircraft would begin taking on more of a cruise missile carrier role as newer bombers are fielded.

B-1B. Although similar to its predecessor, the cancelled B-1A, the B-1B will be a subsonic aircraft with better range and payload characteristics. It will have offensive avionics systems like those being installed on the B-52G/H, updated engines, and lower radar detectability. It will penetrate Soviet air

make up about one-half of the total cruise missile force mentioned above. It would also re-engine a large portion of the KC-135A tanker fleet, thus increasing U.S. ability to refuel bombers in midair and so extend their range.

The major intent of the two-bomber program is to ensure the capability for penetration of Soviet air defenses. The B-1B, with its smaller radar detectability and improved countermeasures, should provide such a capability into the 1990s, according to Administration spokesmen. It would be a very capable conventional bomber as well. The ATB or "stealth" bomber should provide a follow-on capability even in the face of improving Soviet air defenses.

defenses into the 1990s, and then will have cruise missiles added to its weapons mix when the Advanced Technology Bomber is fielded. The first B-1Bs would be delivered in 1985, and all 100 would be in the inventory by 1988.

Advanced Technology Bomber (ATB). The ATB, or "stealth" bomber, incorporates material and design technologies that would make detection by radar and infrared sensors quite difficult. The Administration chose the ATB program as the second part of its two-bomber modernization approach. It will be fielded starting in the early 1990s, with an ultimate force size of 132. Details are classified.

Air-Launched Cruise Missile (ALCM). The ALCM is a small, low-flying, nuclear-armed, unmanned aircraft to be carried by B-52 and B-1B bombers. Launched hundreds of miles from its target, it guides itself by comparing topographical features measured in flight with preprogrammed terrain information. The Administration plans to purchase a total of 3,200 ALCM of all types, which will provide about 2,880 deployed missiles--somewhat fewer than planned by the previous administration. This plan also represents a decrease of about 900 deployed missiles as against the Administration's 1983 program. The plan includes the substitution of an advanced cruise missile (ACM) starting in the mid-1980s, which reportedly will have longer range and even lower radar detectability than its predecessor. About half of the total inventory would eventually be this new ACM.

Short-Range Attack Missile (SRAM). Deployed in the early 1970s, these short-range nuclear-armed missiles can be launched from penetrating bombers to suppress enroute air defenses and to attack--from a distance--targets having their own air defenses.

The Sea-Based Strategic Force

At present the U.S. force of submarine-based missiles consists of 31 Poseidons, each carrying 16 missiles, and 2 Trident submarines each carrying 24 missiles. At any one time, about half of these are at sea and on patrol. Through the 1990s, at least, the U.S. strategic submarine force is expected by many to remain undetectable by the Soviets and thus invulnerable to attack. The Administration seeks to capitalize on this invulnerability by increasing submarine-based capability.

Probably its most important proposal for the sea-based force is to develop and deploy the large, accurate Trident II (D-5) missile--starting in

THE SEA-BASED FORCES

Poseidon Submarines. Of the 31 Poseidon submarines, 12 have been converted from carrying the Poseidon (C-3) missile to the newer, more accurate, longer-range Trident I (C-4) missile. The Navy plans to operate its 31 Poseidon submarines well into the 1990s, for an average lifetime of about 30 years.

Trident Submarines. The newest addition to the ballistic missile submarine (SSBN) fleet is the Trident submarine. Considerably larger than the Poseidon, it has 24 launch tubes (instead of 16) that are larger than those found on any previous U.S. SSBN. The first Trident, USS OHIO, made its initial patrol in the fall of 1982. The second, USS MICHIGAN, is scheduled to deploy in the summer of 1983.

Ten of these submarines have been authorized through fiscal year 1983. Long-lead funds have been authorized for two more. The Administration projects a procurement rate of one submarine per year. The Navy plans to base the first ten Tridents in Bangor, Washington, and is building a second Trident base at King's Bay, Georgia. This study, therefore, assumes that two squadrons of ten SSBNs each will be deployed.

The first eight Trident submarines will be initially fitted with the Trident I (C-4) missile. During their first regular overhaul periods they will be converted to carry the larger Trident II (D-5) missile. All Tridents after number 8 will have the Trident II missile system installed during construction.

1989--as the follow-on SLBM for the fleet of new Trident submarines. This missile would take full advantage of the large missile launch tubes on the new submarines, which the Administration plans to procure at the rate of one per year over the next five years. By the end of 1983, three of these will have been delivered to the Navy. An ultimate goal for the size of the Trident force has not been stated publicly, but CBO assumes for the purposes of this study that the force will reach 20. 9/ Additionally, the Administration would begin deployment of a limited number of nuclear-armed, sea-launched cruise missiles (SLCMs) on selected nuclear-powered

9. See testimony of Rear Admiral William A. Williams III, USN, Subcommittee on Strategic and Theater Nuclear Forces, Senate Armed Services Committee, "Strategic Force Modernization Programs," October,1981, 97:1, p. 175.

Poseidon (C-3) SLBM. The oldest deployed submarine-launched ballistic missile (SLBM), the 2,500-mile-range Poseidon (C-3) was introduced in 1971. It can deliver ten relatively low-yield warheads, and is carried on 19 Poseidon submarines.

Trident I (C-4). Twelve Poseidons carry the longer-range--4,000 miles--Trident I (C-4) missile, introduced in 1979. Each of the first eight Trident SSBNs will carry the C-4 for their first nine years of service until it is replaced by the Trident II (D-5). The Trident I can deliver eight warheads.

Trident II (D-5). The D-5 missile--to be deployed starting in 1989--will be significantly larger than its predecessor, the C-4, and will have a greater payload capability (up to 75 percent more than C-4), much better accuracy, and comparable range at maximum load. It is assumed to carry up to eight Mk21 reentry vehicles (RVs) to 4,000 miles and have an accuracy approaching 400 feet circular error probable (CEP). This accuracy, together with the yield of the Mk21 warhead, will give Trident II "hard-target" destruction capabilities.

Sea-Launched Cruise Missile (SLCM). The Administration plans to deploy approximately 400 nuclear-armed Tomahawk land attack cruise missiles aboard some Los Angeles-class (SSN 688) attack submarines and selected surface ships beginning in 1984. These nuclear-armed SLCMs will be assigned to a non-primary nuclear targeting role.

attack submarines and surface ships, starting in 1984. The Department of Defense estimates the cost of all these efforts in the period 1982-1987 at approximately $42 billion (in 1982 dollars) for investment and operations. 10/

MEASURING THE NEED FOR U.S. STRATEGIC FORCES: HOW MUCH IS ENOUGH?

The U.S. Buildup

If the program just described is carried out, U.S. strategic offensive forces will be expanded and modernized substantially over the next 10 to 15

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10. Note that, as with the bomber and ICBM forces, significant costs would be incurred beyond this period for both procurement and operations and maintenance.

years. Specifically, the count of warheads on all U.S. systems, before any losses in a Soviet first strike, totals about 8,800 in 1983. That number would grow--in the absence of arms control limits--to about 14,000 by 1990 when the MX missile and B-1B bomber would be deployed, and, after further modest growth in the early 1990s, level off again in 1996 when all the programs described above would be completed. Other numerical measures and scenarios may be considered, and these are discussed more fully in the next chapter. But this rough measure suggests the degree of the planned U.S. expansion.

It is important to consider the context within which the Administration plan is presented. One part of that context is the magnitude of the Soviet buildup in strategic weaponry over the past two decades, coupled with a developing U.S. understanding of the Soviet doctrine for employing those forces. Another part--of perhaps greater importance--is the change in the belief about what is needed to deter the Soviets, especially in view of their expanded forces.

The Soviet Buildup

Since the early 1960s, the Soviets have been consistently building up their strategic offensive and defensive forces, in terms both of quantity and of capability. 11/ The centerpiece of this effort has been their ICBM force. Over the past ten years, for example, they have developed and deployed three new ICBMs capable of carrying multiple warheads--including the world's largest deployed ICBM, the SS-18. Ongoing modification and improvement programs have increased the accuracy of these missiles to the point that a fraction of them could, in theory, destroy most of the Minuteman force of land-based missiles in the United States. Recently the Soviets have begun testing two new solid-propellant ICBMs (one of which could be deployed in a mobile mode). They may soon begin testing follow-on versions of their existing SS-18 and SS-19 missiles.

The Soviets have also deployed a substantial sea-based force, recently augmented by installation of the multiple-warhead SS-N-18 missile on relatively new Delta III submarines. By the end of 1983, they will begin to field their newest, longest-range submarine-launched ballistic missile, the SS-NX-20, on their new large submarine, Typhoon. A follow-on submarine-launched ballistic missile will probably begin testing in 1983.

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11. Much of the material in this section is drawn from Department of Defense, Soviet Military Power 1983 (Government Printing Office, 1983).

Although the Soviet strategic bomber force does not have the prominence of its U.S. counterpart, it is also undergoing modernization with the addition of the Blackjack A bomber, expected to be deployed by the mid-1980s. A multi-role aircraft similar to but larger than the B-1B, the Blackjack may carry a new, long-range air-launched cruise missile that could be deployed at about the same time.

By these actions the Soviets have, within the past eight or ten years, more than quadrupled the number of nuclear warheads in their strategic offensive forces. The vast majority of these warheads are carried on systems that are less than ten years old, while replacement systems appear with regularity. CBO estimates that, in the absence of arms-control limits, the Soviets could more than double their current strategic inventory of nearly 9,000 strategic warheads by the mid-1990s, most of which would be capable of attacking targets hardened against nuclear blast (see Appendix C for details).

In addition to expanding its offensive capability, the Soviet Union has developed an extensive active and passive strategic defensive system. To counter U.S. strategic bombers, it has deployed a very large air defense network of radars, surface-to-air missiles, and interceptor aircraft. Soviet civil defense efforts are also significant, with heavy emphasis on protecting the country's leadership in numerous hardened and dispersed shelters.

These substantial efforts have seriously eroded the survival prospects of U.S. land-based missiles and undercut the ability of bomber forces to operate against Soviet air defenses. The efforts of the past decade have also left the Soviet Union with a more modern force, with all the advantages that new-generation systems have over those they replace.

The Deterrent Capability of U.S. Strategic Forces

These numerical comparisons are useful in providing a picture of the strategic competition between the United States and the Soviet Union, but they do not suffice to show whether U.S. strategic forces are strong enough to carry out their primary mission: to deter the Soviets from venturing upon nuclear war or using their forces to coerce the United States. The measure of deterrence is more than numerical; it requires a judgment as to the retaliatory capability that would be necessary to convince the Soviets of the futility of using their nuclear forces.

Over the years, that judgment has changed. Through the early 1950s, when nuclear weapons were in limited supply, U.S. retaliatory plans called

for striking 100 urban areas with up to 300 weapons. 12/ Under the mutual assured destruction (MAD) philosophy of the 1960s and 1970s, deterrence was based on the threat of inflicting "unacceptable damage" on the Soviet Union in response to an attack. Although early in this period the Department of Defense contended that as few as 400 one-megaton weapons could do the job, by the mid-1970s the task expanded such that about 25,000 potential targets had been identified. Some maintain that this increase primarily reflected the growth in the number of U.S. warheads during this period. They contend that the number of significant targets was actually many times fewer than 25,000. 13/ Others hold that as U.S. retaliatory strategy evolved from one aimed primarily at destroying cities to one aimed primarily at destroying the Soviet military and economic base, more facilities became potential targets, many of which were more difficult to destroy.

In the past few years, dependence on MAD alone has lost its credibility, in the view of many, as an acceptable strategy for deterring the Soviets. Opponents of MAD argue the need to respond in more flexible, perhaps limited, ways to Soviet initiation of nuclear war. They hold that the capability to do so might be critical in deterring the Soviets from launching a nuclear conflict or seeking leverage in regional situations through "nuclear blackmail." Some contend that Soviet military writings demonstrate a belief that nuclear conflict could begin with a series of limited strikes and counterstrikes against military targets, such as missile silos or command bunkers, most of which are heavily hardened against nuclear attack. Those advocating a strengthening of U.S. capabilities to wage a nuclear war of this type argue that a president faced with a limited strike against a few military targets might not be willing to unleash a massive U.S. counterattack knowing that it would call forth a similar massive response from the Soviets. If the Soviets were to believe that the United States would be so paralyzed, they might not be deterred from launching a limited strike.

The need for a choice of ways to respond to a limited strike, while also maintaining the capability for a massive strike, has increased the demands placed on nuclear weapons in two ways. First, the number of

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12. For details see Thomas Powers, "Choosing a Strategy for World War III," The Atlantic Monthly (November 1982), p. 91.

13. Ibid., p. 109. Note that the number of targets is not necessarily synonomous with the number of weapons needed to attack them successfully.

potential targets in the Soviet Union included in U.S. targeting plans has continued to grow, and is now estimated by some to be over 40,000. (Added types of targets include key communications nodes, military and political headquarters, war-supporting industries, storage sites for nuclear weapons, and rear-area conventional military support.)14/ Second, new attack strategies have been created that place greater operational demands on the forces, such as the capability of being employed over a protracted period of time in many and highly selective attack options. 15/ These added demands are responsible in part for the Administration's plans to add more warheads and make those warheads better able to attack hardened targets. More important, these added demands motivate U.S. efforts to field systems that will be more survivable. Greater survivability would lower Soviet confidence in the success of a first strike and lower the U.S. inventory necessary to accomplish targeting objectives.

Nevertheless, some do not agree that changes in strategic doctrine, with attendant demands for more and better weapons, are needed to deter nuclear war. They argue, for example, the implausibility of limited nuclear war or the need for striking small, selected sets of targets. Instead, they contend that simpler, more direct approaches might deter, such as ensuring great damage to the things the Soviets value most highly, like their political leadership structure. Still others argue that just having the capability to destroy a large part of an opponent's cities and industrial facilities would deter. 16/ By this last metric, both the United States and the Soviet Union have many times the numbers of nuclear warheads needed.

This paper does not try to measure the deterrent capability of the Administration's program or of alternatives to it. Instead, CBO estimates the effects of different programs in terms of changes in U.S. strategic weapons inventories, a method of judging capabilities frequently used by the Department of Defense. The strengths and limitations of this method are described in the next chapter, as are some of the qualitative features of the Administration's plan that cannot be captured in quantitative terms.

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14. For details see Desmond Ball, "U.S. Strategic Forces: How Would They Be Used?" International Security, vol. 7, no. 3 (Winter 1982/1983), p. 36.

15. Ibid., p. 37.

16. See, for example, Maxwell D. Taylor, "Build Up the Forces We Really Need," Washington Post, March 6, 1983, p. C8, and Stansfield Turner, "The 'Folly' of the MX Missile," New York Times Magazine, March 13, 1983, p. 84.